UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CHEMICAL CHARACTER OF GROUND WATER IN THE SHALLOW WATER-TABLE AQUIFER AT SELECTED LOCALITIES IN THE MEMPHIS AREA, TENNESSEE

By W. S. Parks, D. D. Graham, and J. F. Lowery

Open-File Report 81-223

Prepared in cooperation with the

MEMPHIS AND SHELBY COUNTY OFFICE OF PLANNING AND DEVELOPMENT

Memphis, Tennessee
1981

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE **1981**	2. REPORT TYPE **N/A**	3. DATES COVERED **-**
4. TITLE AND SUBTITLE **Chemical Character of Ground Water in the Shallow Water-Table Aquifer at Selected Localities in the Memphis Area, Tennessee**		5a. CONTRACT NUMBER 5b. GRANT NUMBER 5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)		5d. PROJECT NUMBER 5e. TASK NUMBER 5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **U.S. Department of the Interior 1849 C Street, NW Washington, DC 20240**		8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S) 11. SPONSOR/MONITOR'S REPORT NUMBER(S)
12. DISTRIBUTION/AVAILABILITY STATEMENT **Approved for public release, distribution unlimited**		
13. SUPPLEMENTARY NOTES		
14. ABSTRACT		
15. SUBJECT TERMS		

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**SAR**	**32**	

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CHEMICAL CHARACTER OF GROUND WATER IN THE SHALLOW WATER-TABLE AQUIFER AT SELECTED LOCALITIES IN THE MEMPHIS AREA, TENNESSEE

By W. S. Parks, D. D. Graham, and J. F. Lowery

INTRODUCTION

The City of Memphis depends solely on ground water for its water supply. About 97 percent of inventoried pumpage in the Memphis area, which totaled about 194 Mgal/d in 1979, is from the Memphis Sand. This aquifer generally has been believed to be separated from the shallow water-table aquifer (alluvium and fluvial deposits) by a relatively thick and wide-spread confining bed consisting chiefly of clay. Studies by the Geological Survey in recent decades, however, have indicated that part of the recharge to the Memphis Sand probably is derived by vertical leakage from the shallow water-table aquifer through the confining bed and that locally "windows" of sand exist in the confining bed through which any contaminants in the shallow water-table aquifer could enter the Memphis Sand (See Criner and others, 1964, p. 30; Bell and Nyman, 1968, p. 7-8; Parks and Lounsbury, 1976, p. 26-27).

More recently, additional evidence of vertical leakage being a component of recharge to the Memphis Sand was provided during the calibration of a digital computer model of the aquifers in the Memphis area. For this calibration a leakage factor, averaging about 20 percent over the Memphis area, had to be applied to the model in order to simulate known historic water levels in the Memphis Sand (J. V. Brahana, 1980, oral commun.). This discovery has heightened concern about the possibility of contaminants being in the shallow water table aquifer, and thus, the potentiality for any contaminants to enter the Memphis Sand.

Areas where the shallow water-table aquifer is most susceptible to contamination are those that have been or are being used for waste disposal. Historically, Memphis and Shelby County along with private concerns and industries have used dumps and landfills in two geologically and topographically different areas--the flood plains of nearby streams and abandoned gravel pits in upland areas. These dumps and landfills have received a large variety of wastes including ashes, construction and demolition materials, garbage, rubbish, street refuse, and chemical and industrial wastes. Most of these dumps and landfills were closed in the early 1970's at the beginning of state regulation of waste disposal practices. Nevertheless, leachates from these waste disposal facilities presumably have been and are entering the shallow water-table aquifer.

Table 1 shows the post-Midway geologic units underlying the Memphis area and their environmental significance.

Table 1.--Post-Midway geologic units underlying the Memphis area (From Parks and Lounsbury, 1976)

System	Series	Group	Stratigraphic unit	Thickness (ft)
Quaternary	Holocene and Pleistocene		Alluvium	0-175
	Pleistocene		Loess	0-65
Quaternary and Tertiary (?)	Pleistocene and Pliocene (?)		Fluvial deposits (terrace deposits)	0-100
Tertiary	Eocene	?	Jackson Formation and upper part of Claiborne Group ("capping clay")	0-350
		Claiborne	Memphis Sand ("500-foot" sand)	500-880
		Wilcox	Flour Island Formation	160-350
	?		Fort Pillow Sand ("1400-foot" sand)	210-280
	Paleocene		Old Breastworks Formation	200-300

and their environmental significance.

Lithology and hydrologic significance
Sand, gravel, silt, and clay. Provides borrow material for fills and levees and some aggregates for concrete and bituminous mixes. Used as foundation material or base on which fill is placed for residences and light buildings in flood plains. Lower sand and gravel beneath Mississippi Alluvial Plain used as foundation material for heavy structures. Supplies water to a few industrial wells on Presidents and Mud Islands.
Silt, silty clay, and minor sand. Used generally as foundation material for residences and light buildings in upland areas. Provides material for fills placed in low places and flood plains. Thick deposits utilized for solid waste disposal.
Sand and gravel; minor ferruginous sandstone and clay. Provides most commercial aggregates for concrete and bituminous mixes. Used as a foundation material for heavy structures and high-rise buildings in upland areas. Supplies water to many shallow domestic wells in suburban and county areas. Some abandoned gravel pits utilized for solid waste disposal.
Clay, fine-grained sand, and lignite. Used as foundation material for heavy structures and for high-rise buildings where overlying fluvial deposits are thin or absent and where alluvial materials are unsuitable. Supplies water to some shallow wells completed in sands below the fluvial deposits, but generally considered to be of low permeability and to confine water in Memphis Sand. Lower boundary very poorly defined.
Fine- to coarse-grained sand; subordinate lenses of clay and lignite. Very good aquifer from which most water for public and industrial supplies is obtained. Upper boundary very poorly defined.
Clay, fine-grained sand, and lignite. Confines water in Memphis Sand and Fort Pillow Sand.
Fine- to medium-grained sand; subordinate lenses of clay and lignite. Once used as second principal aquifer for Memphis; now reserved for future use. Presently supplies water to a few industrial wells.
Clay, fine-grained sand, and lignite. Relatively impermeable lower confining bed for water in Fort Pillow Sand.

PURPOSE AND SCOPE OF THIS PROJECT

The Geological Survey presently monitors eight deep wells in the Memphis area to detect any changes in the chemical character of water moving through the Memphis Sand towards major pumping centers. These wells are strategically located so as to intercept ground water en route through the Memphis Sand from the outcrop-recharge area. Although water-quality analyses are available for many wells in the shallow water-table aquifer, no specific investigation has been made to characterize the quality of the water in this aquifer from which the Memphis Sand also receives part of its recharge.

The purpose of this investigation is to determine the chemical character of ground water in the shallow water-table aquifer at selected localities in the Memphis area. Major elements in this investigation are to:

(1) install and sample shallow wells in the water-table aquifer downgradient from representative sources of contaminants such as waste disposal sites;
(2) sample selected water wells in the Memphis Sand in the direction of ground-water flow in that aquifer from possible contaminated areas;
(3) analyze the samples to determine the presence or absence of contaminants and to identify and quantify any hazardous constituents; and
(4) prepare a report to present the data and findings of the investigation.

The wells are to be sampled twice in 1980--first in the spring or early summer when water levels are high and second in the fall when water levels are low. This report presents the findings of the initial sampling.

WASTE DISPOSAL DUMPS UNDER INVESTIGATION

Six waste-disposal dumps in the Memphis area have been identified, thus far, as having received unknown quantities and types of chemical and/or industrial wastes (Waste Age, 1979, p. 54, 56). These dumps are the (1) Bellevue Dump, (2) Brooks Road Dump, (3) Hollywood Dump, (4) Jackson Pit Dump, (5) Millington Dump/Landfill, and (6) Old Ordnance Dump. Of these six dumps, the Bellevue, Brooks Road, Hollywood, and Jackson Pit Dumps were selected for a reconnaissance investigation because of their proximity to the major cone of water-level depression in the Memphis Sand or to existing or proposed well fields of Memphis Light, Gas and Water Division.

Figure 1 shows the locations of the four waste-disposal dumps under investigation with respect to the major cone of depression in the Memphis Sand; figures 2 through 5 show the specific locations of these four dumps and the wells installed and/or sampled for this initial effort.

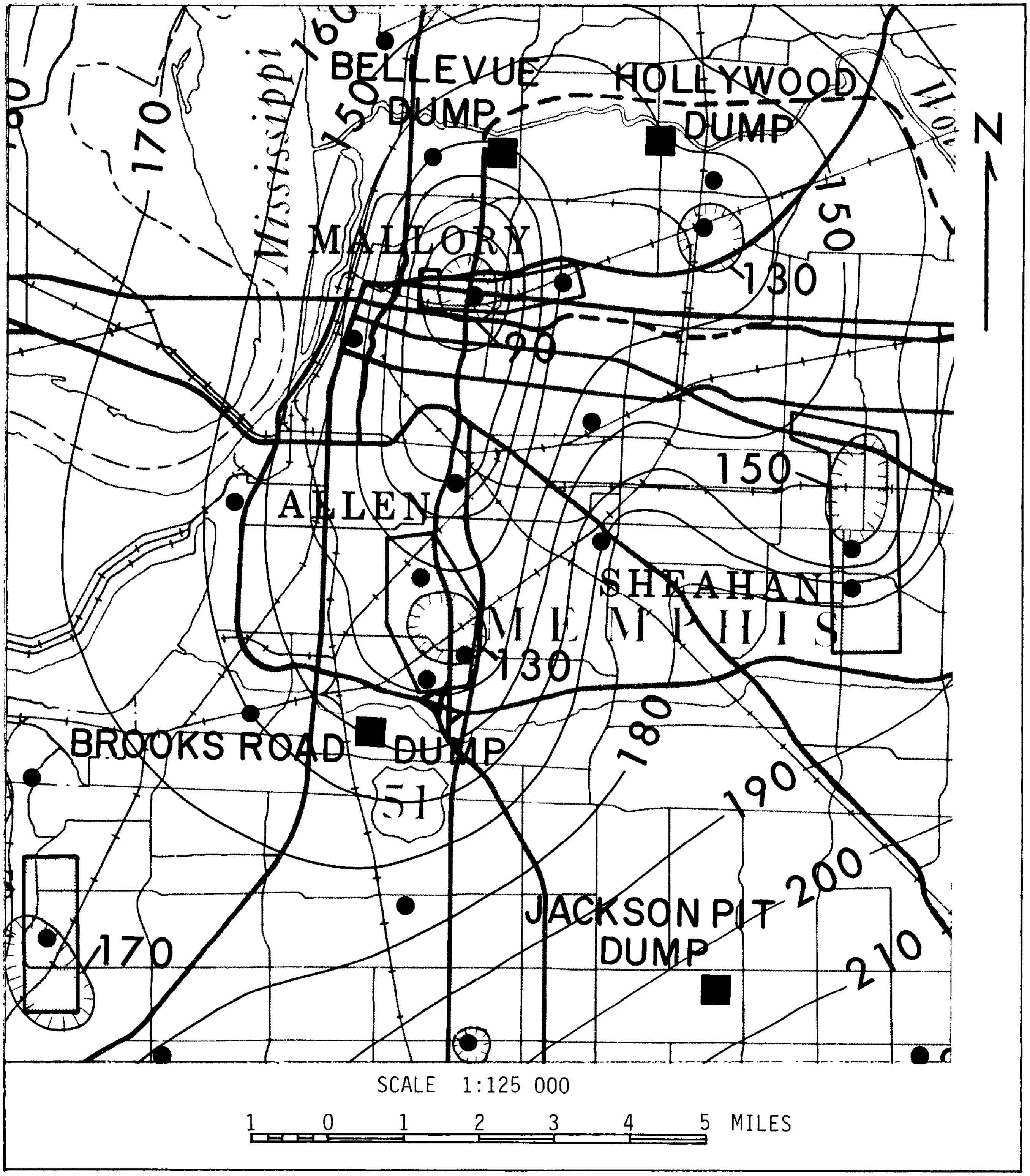

Figure 1.--Location of the four abandoned waste-disposal dumps under investigation with respect to the major cone of depression in the Memphis Sand at Memphis, Tenn. Contours indicate the altitude at which water levels would have stood in tightly cased wells in the Memphis Sand in August 1978. (From Graham, 1979).

Bellevue Dump

The Bellevue Dump is in north Memphis south of the Wolf River between North Watkins Street on the east and Cypress Creek on the south and west (fig. 2). This dump occupies an excavation made in the alluvial plain of the Wolf River for mining of sand by dredging from man-made lakes.

Surface-water drainage from the dump is to the northwest into a residual lake left by the sand mining operation and north into the Wolf River. Water flows from the residual lake into the Wolf River at falling stages, but from the Wolf River into the lake during rising stages. Surface-water drainage is restricted towards the east by the fill for North Watkins Street and towards the southeast by the levee for Cypress Creek. The Wolf River flows from east to west just north of the dump.

The direction of ground-water flow in the water-table aquifer can be presumed to be in most any direction inasmuch as the dump is higher than most surrounding areas. However, the principal direction of ground-water flow from a large part of the dump is presumed to be to the northwest in the principal direction of surface-water drainage.

Well O-230[1] was installed on the northwest side of the dump. The auger hole for the well penetrated, from land surface to total depth, about 19 feet of fill and refuse, 5 feet of silt, and 7.5 feet of fine to medium sand. The hole was terminated at 31.5 feet in Wolf River alluvium.

Brooks Road Dump

The Brooks Road Dump is in south Memphis between Nonconnah Creek on the north and Brooks Road on the south, about 0.5 to 1 mile east of U.S. Highway 61 (fig. 3). This dump was made on the alluvial plain of Nonconnah Creek and consists of two parts--east and west segments--separated by about 0.2 mile.

Surface-water drainage is into ditches that surround most of both segments of the dump. It is then discharged into Nonconnah Creek. Nonconnah Creek flows from east to west just north of the dump.

The direction of ground-water flow in the water table aquifer can be presumed to be in two general directions--northward from the high areas south of the dump towards Nonconnah Creek and westward down Nonconnah Creek valley. The vector of these two general directions is towards the northwest, which is presumed to be the general direction of ground-water flow beneath the dump.

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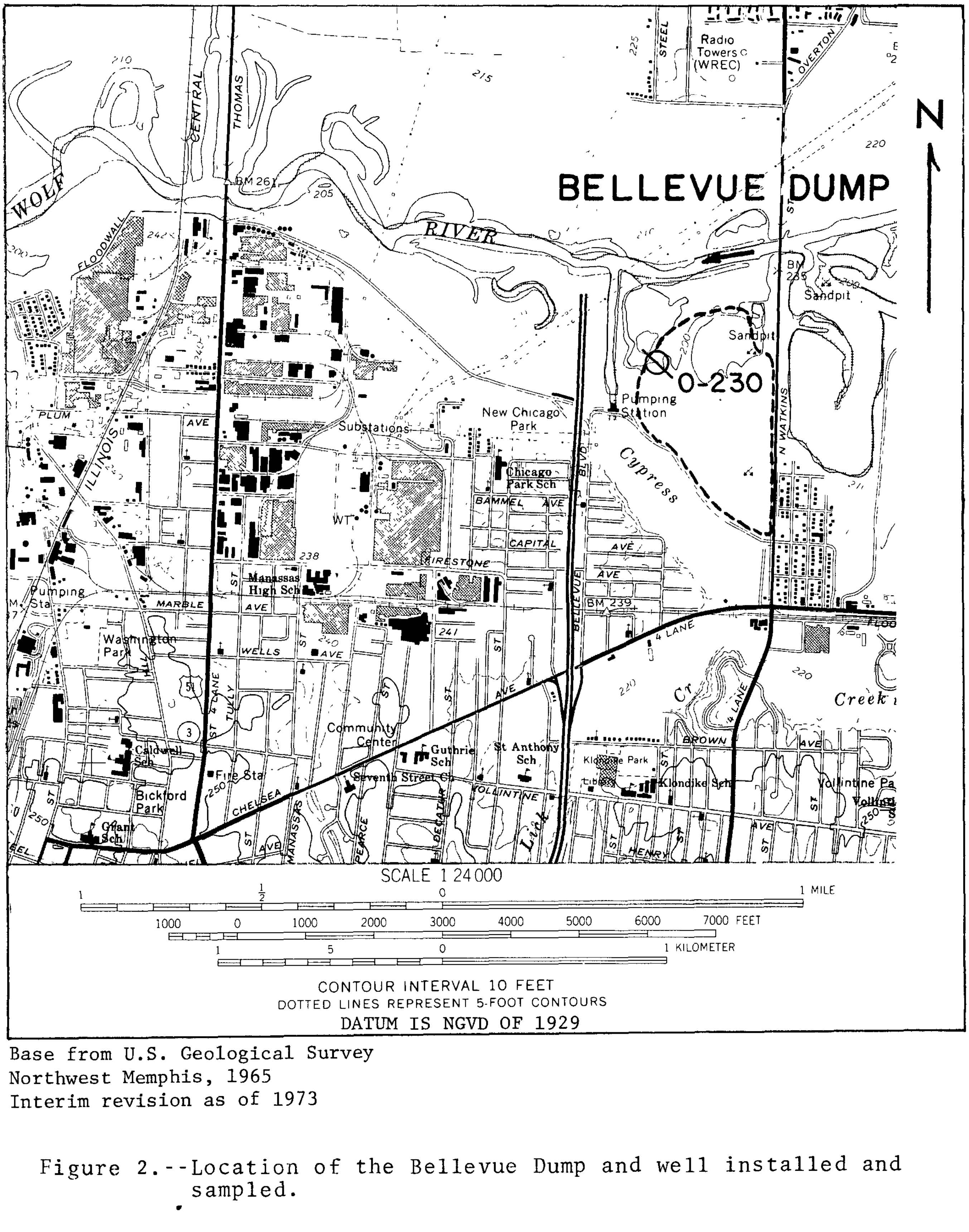
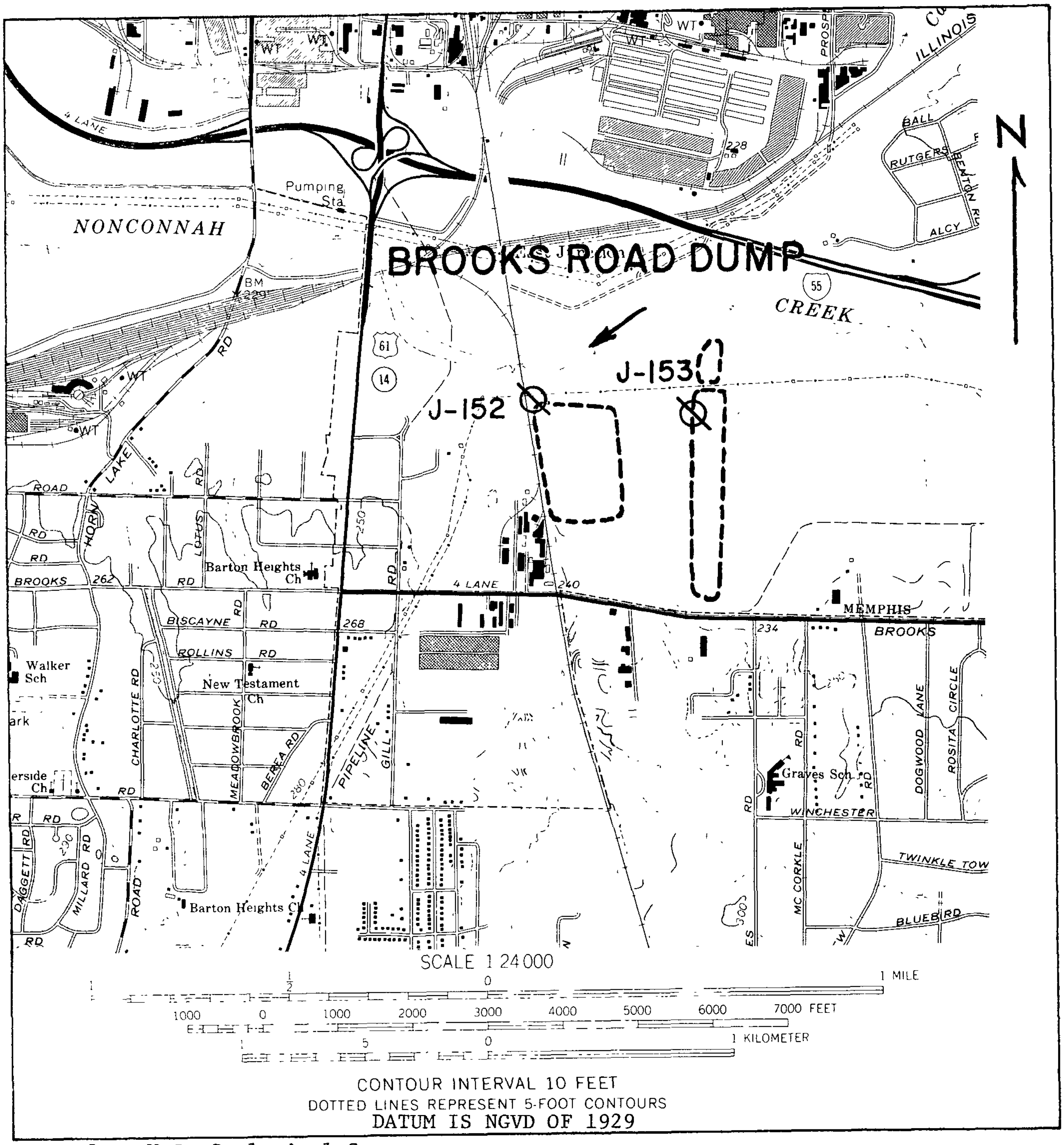
[1]Well numbers are Geological Survey local well-numbering system for Tennessee and are generally prefixed "Sh:" for Shelby County, e.g., Sh:O-230.



Base from U.S. Geological Survey
Northwest Memphis, 1965
Interim revision as of 1973

Figure 2.--Location of the Bellevue Dump and well installed and sampled.



Base from U.S. Geological Survey
Southwest Memphis, 1965
Interim revision as of 1973

Figure 3.--Location of the Brooks Road Dump and wells installed and sampled.

Well J-152 was installed at the northwest corner of the west segment. The auger hole for this well penetrated about 16.5 feet of silty clay, 10.5 feet of silty sand and gravel, and 2.5 feet of fine sand. The hole was terminated at 29.5 feet in Nonconnah Creek alluvium.

Well J-153 was installed on the west side of the northern extension of the east segment. The auger hole for this well penetrated about 13 feet of silty clay, 7 feet of sandy silt, and 14 feet of gravelly sand. The hole was terminated at 34 feet in Nonconnah Creek alluvium.

Hollywood Dump

The Hollywood Dump is in north Memphis on both sides of Hollywood Street just south of the Wolf River (fig. 4). This dump was made on the alluvial plain of the Wolf River.

Surface water drains from the dump into several ditches along the margins of the dump into the Wolf River. The ditches in turn discharge into nearby low areas and lakes or into the Wolf River. The Wolf River flows east to west just north of the dump.

The direction of ground-water flow in the water-table aquifer can be presumed to be in two general directions--northward from the original high ground south of the dump towards the Wolf River and westward down the Wolf River valley. The vector of these two general directions is towards the northwest, which is presumed to be the general direction of ground-water flow beneath the dump.

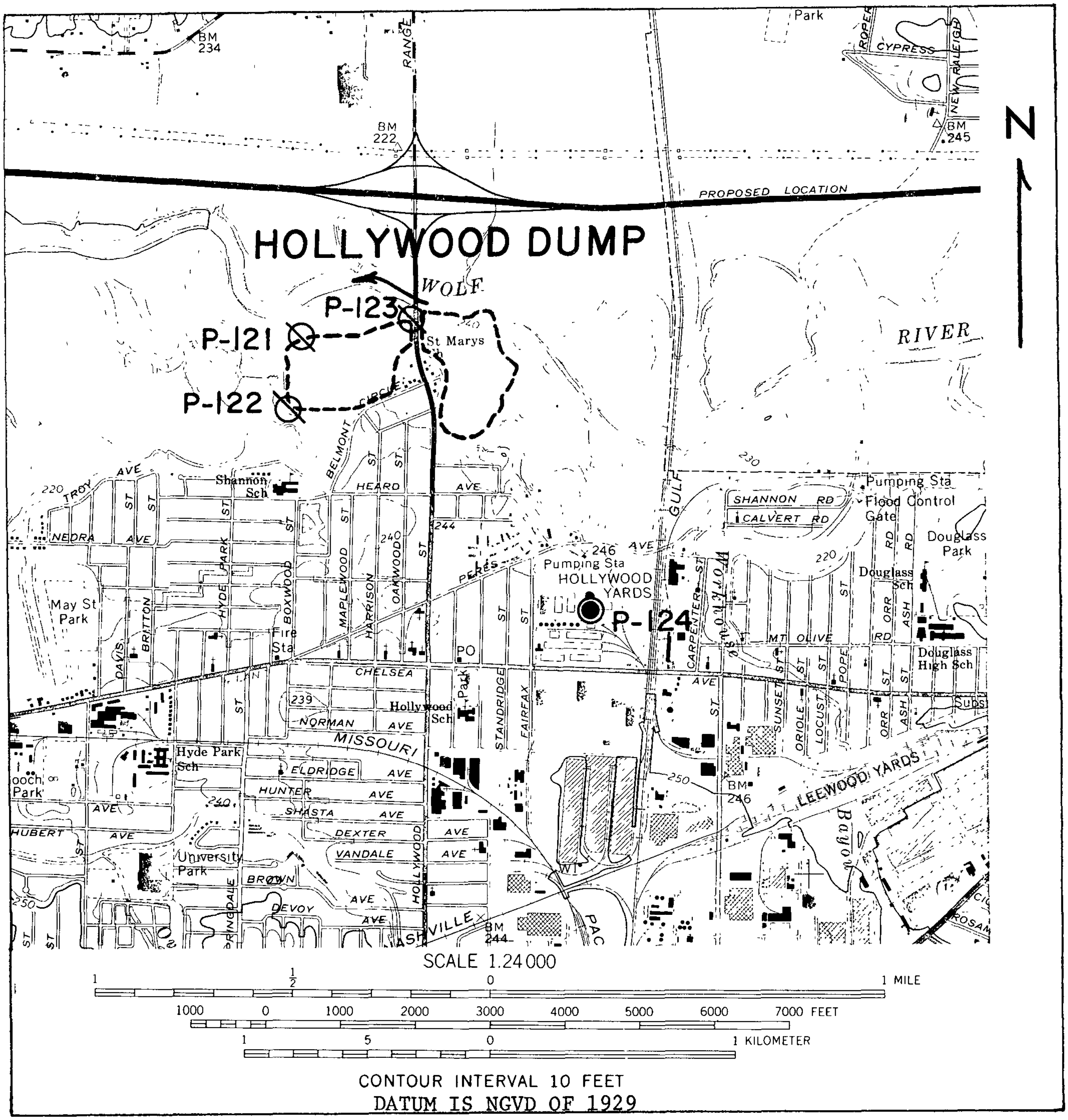
Well P-121 was installed near the northwest corner in an area where barrels containing pesticide residue had been buried at depths of a few feet. The auger hole for this well penetrated about 18 feet of silty clay, 6 feet of sand and gravel, and 1 foot of silty fine sand. The hole bottomed at 25 feet in Wolf River alluvium.

Well P-122 was installed near the southwest corner near the so-called "endrin pit." The auger hole for this well penetrated about 6 feet of silty clay and fill or refuse, 4 feet of sandy clay, 5 feet of silty sand, and 5 feet of fine to medium sand. The hole was terminated at 20 feet in Wolf River alluvium.

Well P-123 was installed near the north edge of the dump just west of the Hollywood Street bridge across Wolf River. The auger hole for this well penetrated 8.5 feet of fill or refuse, 11.5 feet of silty sand, and 10 feet of fine to medium sand. The hole terminated at 30 feet in Wolf River alluvium.

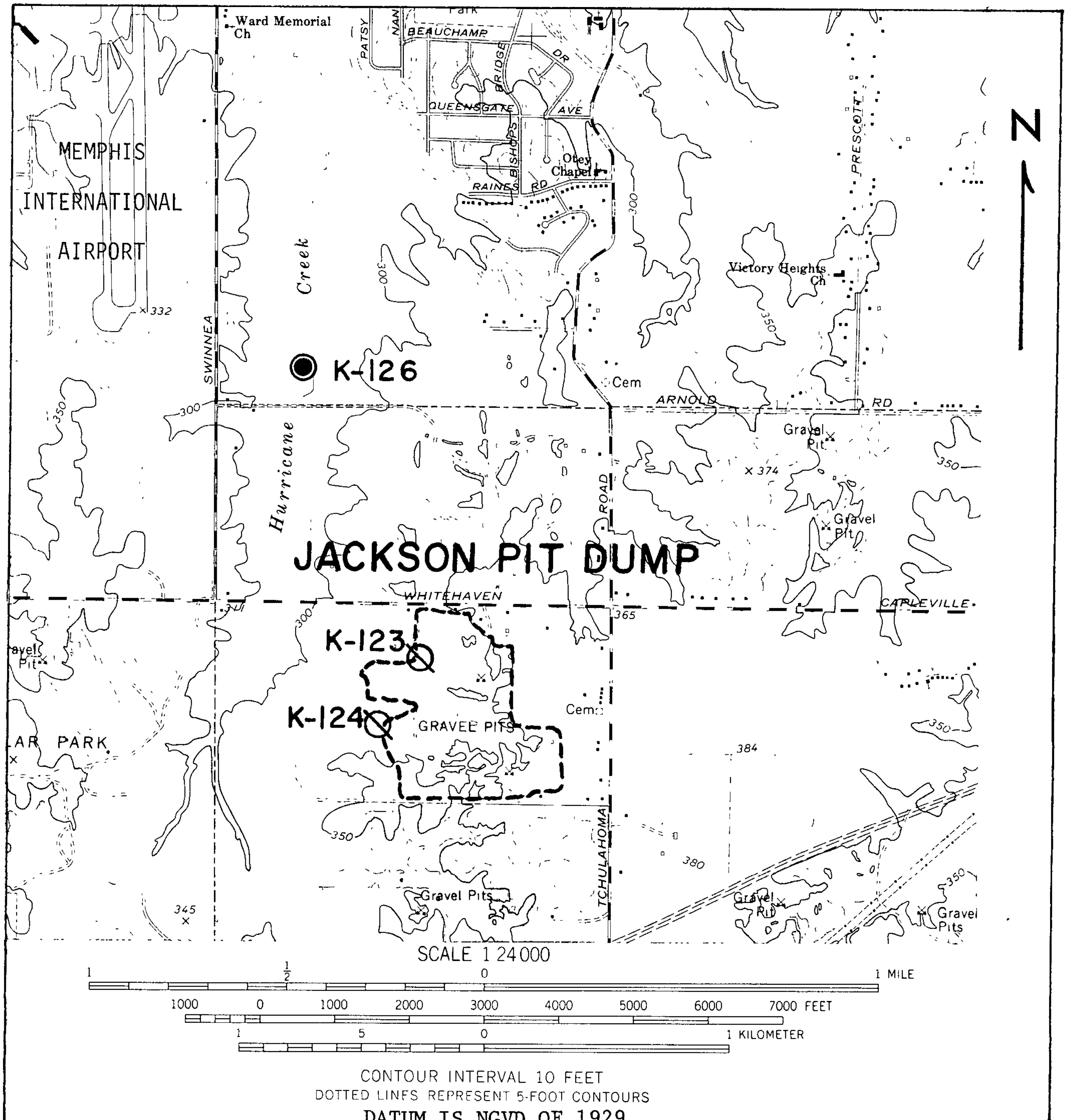
Jackson Pit Dump

The Jackson Pit Dump is in southeast Memphis near Memphis International Airport on the south side of Whitehaven-Capleville Road (Shelby Drive), about 0.5 mile west of Tchulahoma Road (fig. 5). This



Base from U.S. Geological Survey
Northeast Memphis, 1965
Interim revision as of 1973

Figure 4.--Location of the Hollywood Dump and wells installed and/or sampled.



Base from U.S. Geological Survey
Southeast Memphis, 1965
Interim revision as of 1973

Figure 5.--Location of the Jackson Pit Dump and wells installed and/or sampled.

dump occupies an abandoned gravel pit in which the loess was removed as overburden to mine sand and gravel in the fluvial deposits.

Surface water from the dump drains westward into Hurricane Creek. The dump is more or less separated into north and south segments by a small tributary of Hurricane Creek. This small tributary, which flows east to west, receives surface-water drainage from a large part of both segments. Hurricane Creek flows northward about 0.2 mile west of the dump.

The direction of ground-water flow in the water-table aquifer is locally complicated because of a variable topography and geology. The general direction of ground-water flow, however, is presumed to be westward and northward following the general pattern of surface-water drainage.

Well K-123 was installed on the west side of the north segment. The auger hole for this well penetrated at least 9 feet of fill, 20 feet with no returns from the auger (probably fill and fluvial deposits), and 10 feet of silty fine sand. The hole was terminated 39 feet in the Jackson Formation or upper part of the Claiborne Group.

Well K-124 was installed on the west side of the south segment of the dump. The auger hole for this well penetrated about 10.5 feet of silty clay (loess), 2 feet of clayey gravel (fluvial deposits), and 4.5 feet of silty clay and 27 feet of silty fine sand. The hole was terminated at 44 feet in the Jackson Formation or upper part of the Claiborne Group.

Originally, it was planned to complete the wells at the Jackson Pit Dump in the sand and gravel of the fluvial deposits which along with the alluvium makes up the shallow aquifer in the area. This geologic unit was found to be thin or absent in the places augered. Consequently, the wells were screened in the Jackson Formation or upper part of the Claiborne Group which underlies the fluvial deposits.

WELL INSTALLATION

The eight shallow wells for this project were installed for the Geological Survey by the U.S. Army Corps of Engineers. The hollow-stem auger method of drilling was selected instead of the hydraulic rotary method to avoid the introduction of water and drilling mud into the aquifers. Stainless steel was selected as the material for the well points (screens) and riser pipe instead of polyvinyl chloride (PVC) to avoid contaminating the water to be sampled.

Figure 6 is a schematic diagram showing the construction plan used for the shallow wells. The general procedures followed in installing each well are as follows:

(1) the auger stem was cleaned inside and outside by spraying with reagent-grade isopropyl alcohol using a stainless-steel garden sprayer;

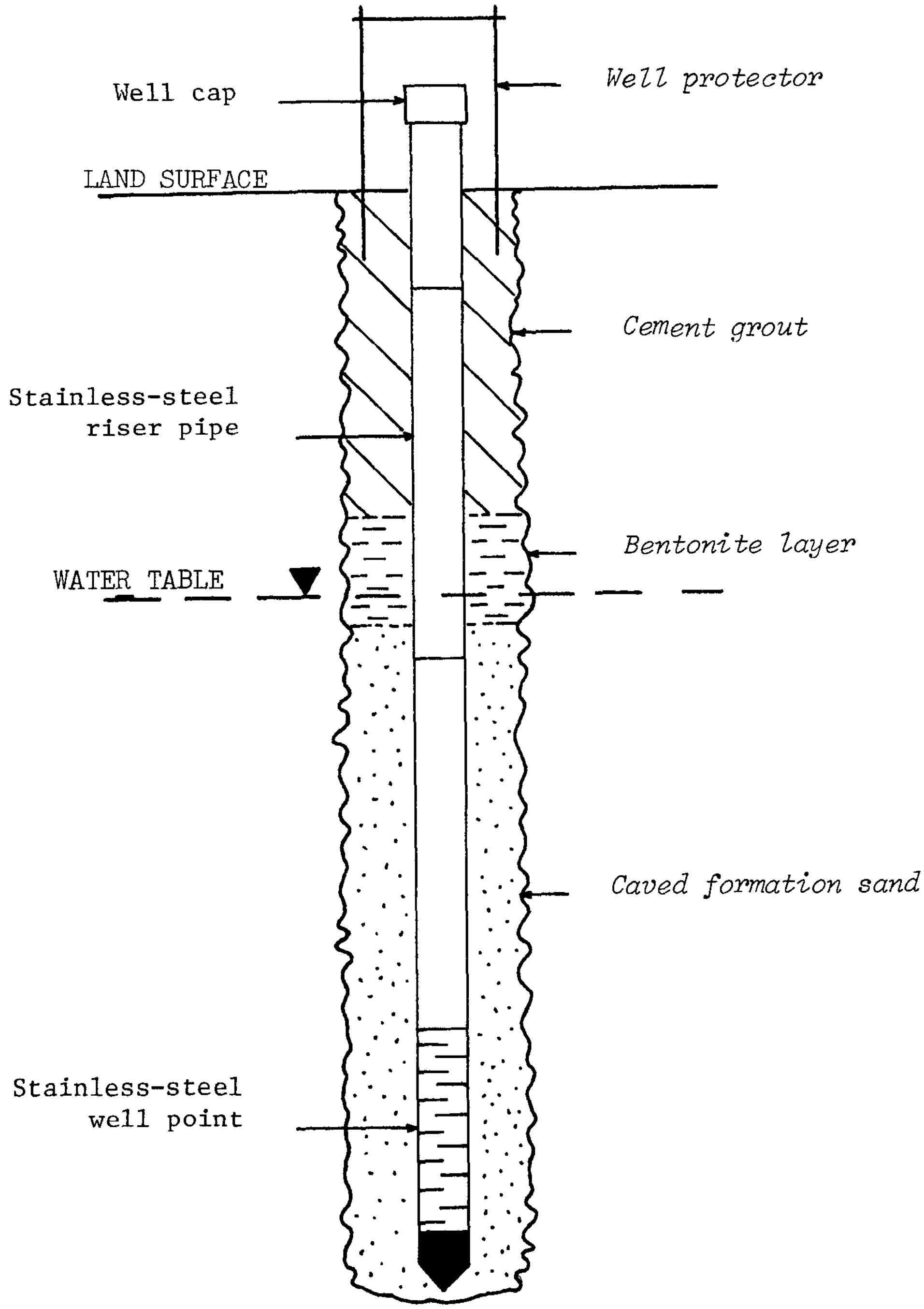


FIGURE 6.--Schematic diagram showing construction of shallow wells.

(2) a hole was augered to the first water-bearing sand at a predetermined depth or to a depth necessary to penetrate a sand or sandy material in which the well point could be set;
(3) the water level was measured through the hollow auger-stem to insure that the top of the well point was a least 10 feet below the static water table;
(4) a 2-inch diameter stainless-steel, 5-feet-long well point (slot size 0.010 inch) and the needed amount of 2-inch diameter stainless-steel riser pipe was lowered through the hollow auger-stem and pushed out the bottom;
(5) the auger stem was carefully removed from the auger hole, leaving the well point and riser pipe set at the desired depth;
(6) the annular space around the riser pipe was probed to determine the depth to which sand had caved around the well point and riser pipe, which generally was found to be about the level of the water table;
(7) an amount of 1/2-inch diameter bentonite pellets to make a 3-foot layer or more was poured into the annular space around the riser pipe to seal the well above the caved sand;
(8) a mixture of sand and cement (cement grout) was slowly poured into the remaining annular space around the riser pipe to seal the well above the bentonite layer to land surface;
(9) a well protector, consisting of a 30-inch length of 10-inch diameter steel pipe with a lockable steel plate on top, was seated in the cement grout; and
(10) the well was capped, the well protector locked, and the drilling site was cleaned up.

Deviations from the above general procedures in installing individual wells are:

(1) well O-230 at the Bellevue Dump, the last to be drilled, was constructed by using 15.9 feet of galvanized-steel pipe in its upper part because of a short supply of stainless-steel pipe, and
(2) well P-122 at the Hollywood Dump had no bentonite pellets placed between the formation sand and the cement grout because the sand caved to within 2.4 feet of land surface.

In selecting locations for the eight shallow wells, care was taken to locate them off the main dump areas. Nonetheless, several holes unavoidably were augered through fill or refuse. For example, the auger hole for well O-230 at the Bellevue Dump penetrated about 19 feet of fill and refuse. This well could not be installed outside the margin of the dump because at the well site the dump is bordered by a 15 to 20 feet drop off to the shore of a lake. Augering through the refuse at this dump was not considered a serious consequence inasmuch as it occupies an excavation in the alluvial plain and refuse no doubt was placed in contact with the water-table aquifer.

The auger hole for well K-123 at the Jackson Pit Dump penetrated at least 9 feet of fill on which the access road to the dump was built. This material appeared to consist chiefly of construction and demolition waste and refuse. Starts were made at several different locations before a place could be found that the auger would penetrate the fill.

The auger holes for wells P-122 and P-123 at the Hollywood Dump penetrated about 6 feet and 8.5 feet of fill or refuse, respectively. This fill or refuse was below the main body of the dump in an area where it was not expected and may represent refuse that fell or was pushed down the slope or miscellaneous materials not related to the principal waste-disposal activity.

WELL DEVELOPMENT

Before sampling, the wells required development to increase yields and to clear the water of formation sediment. Two methods of well development were used, depending on the depths of the water levels and the character of the aquifer materials screened. In general, these two well development techniques consisted of (1) surging and pumping the well at the highest rate possible using a centrifugal pump and (2) injecting and surging air through the screen using an air compressor. Table 2 gives details concerning the eight shallow wells, including the technique and duration of well development used.

Wells O-230, P-122, and P-123 had water levels and yields high enough to permit well development by pumping with a centrifugal pump. Although this method was effective in clearing the water of sediment, additional sediment re-entered the well in a short period of time after pumping ceased. After initial sampling, these wells were additionally developed using compressed air in hopes that development would be adequate for future sampling.

Wells J-152, J-153, and P-121 also had water levels high enough for pumping with a centrifugal pump, but the formation materials screened were too tight to give up enough water for pumping. Wells J-152 and J-153 were developed by backflushing with clear water and with compressed air. Water used for this purpose was taken from the city's water supply system to avoid introduction of contaminants into the ground. Well P-121 was developed with compressed air. After development, all three wells were pumped with a centrifugal pump.

Wells K-123 and K-124 had water levels and yields too low to develop using a centrifugal pump. These wells were screened in silty fine sand, much of which was finer than the slot size selected for the screens (0.010 inch). These wells required an extended period of development using compressed air.

SAMPLING OF SHALLOW WELLS

Water samples for analysis were collected from the eight shallow wells at the end of a pumping period which followed or included well development. The length of this pumping period varied depending on

Table 2--Records of shallow wells installed at abandoned waste-disposal dumps.

Well No.	Date drilled	Altitude[1/] (ft)	Screen setting (ft)	Water level Depth (ft)	Water level Date	Well development compressed air (hr)	Well development centrifugal pump (hr)	Measured or estimated(e) yield of well (gal/min)	Time pumped continuously before sampling (hr)
					BELLEVUE DUMP				
0-230	5-28-80	217.2	25.7-30.7	13.92	6-05-80	none	2	13	2
					BROOKS ROAD DUMP				
J-152	5-14-80	216.0	24.4-29.4	13.50	6-20-80	2[2/]	6	1	5
J-153	5-14-80	222.0	28.1-33.1	12.50	6-19-80	1.5	2.5	3	2
					HOLLYWOOD DUMP				
P-121	5-28-80	221.5[3/]	19.1-24.1	13.25	6-11-80	3	1.5	3	1.5
P-122	5-13-80	218.0[3/]	14.4-19.4	2.34	6-02-80	1[2/]	4	23	3
P-123	5-12-80	219.5[3/]	24.4-29.4	11.89	6-02-80	1[2/]	5	15	2
					JACKSON PIT DUMP				
K-123	5-15-80	342.1	32.4-37.6	15.47	6-05-80	4	none	0.5(e)	0.5
K-124	5-27-80	343.4	38.2-43.2	25.88	6-05-80	4	none	0.5(e)	0.5

1/Altitude above National Geodetic Vertical Datum of 1929: A geodetic datum derived from a general adjustment of the first order level nets of both the United States and Canada, formerly called "Mean Sea Level."

2/Additional well development after initial sampling.

3/Adjusted to land-surface datum from survey of altitudes of top of well protector by the Tennessee Valley Authority.

the individual characteristics of the well and the technique of well development. Table 2 gives the length of the period continuously pumped before each well was sampled.

Wells J-152, J-153, O-230, P-121, P-122, and P-123 had water levels and yields high enough to sample by pumping with a centrifugal pump. These wells were pumped for the period of time thought necessary to insure well development and to clear the water of formation sediment. Wells K-123 and K-124 had water levels and yields too low to pump with a centrifugal pump. These wells were cleared of as much sediment as possible during well development with compressed air and then were additionally evacuated using a squeeze-type pump of low capacity (about 0.5 gal/min) before sampling.

Temperature and specific conductance were measured periodically during the pumping period of all wells to insure that these parameters had stabilized before sampling was conducted. All bottles and equipment that would be in contact with the water were washed or thoroughly rinsed with the water to be sampled before sampling. When the squeeze-type pump was used, this equipment first was rinsed with reagent-grade isopropyl alcohol and then rinsed with deionized water before sampling.

For all wells, water samples to be analyzed for common constituents and selected trace metals were taken from the discharge of the pumps (either centrifugal or squeeze-type). Samples to be analyzed for selected organic compounds then were taken from the well at a level within or just above the screen using a nickel-coated brass bailer designed for sampling wells.

Water-quality parameters measured in the field were temperature, specific conductance, pH, and alkalinity. Water samples for laboratory analysis were collected in plastic or glass bottles, labeled, and treated as required according to standards set by the U.S. Geological Survey for its National water quality program. These bottles were chilled in ice chests, sealed with fiber tape, and shipped on the day of sampling to the laboratory.

SAMPLING OF DEEP WELLS

A search was made to find wells in the Memphis Sand downgradient from the dumps under investigation to determine if any contaminants could be detected in this deeper aquifer. Two wells--K-126 (fig. 5) and P-124 (fig. 4) were selected for this initial sampling.

Well K-126 is about 4,000 feet northwest of the Jackson Pit Dump in the general direction of ground-water flow in the Memphis Sand towards the center of the major cone of water-level depression at Memphis. According to a driller's record on file with the Tennessee Division of Water Resources, this well is 302 feet deep and is screened from 276 to 296 feet. The well is pumped intermittently for short periods of time during the day at a reported rate of 200 gal/min to supply water to a ready-mix concrete plant.

Well P-124 is about 3,000 feet southeast of the east segment of the North Hollywood Dump in the presumed direction of ground-water flow in the Memphis Sand towards the center of a subsidiary cone of depression caused by pumpage by industry in the Chelsea Avenue-Warford Street area. According to the driller's record, this well is 466 feet deep and is screened from 400 to 460 feet. The well is pumped more or less continuously at a reported rate of 1,500 gal/min to supply water to an industry.

Wells K-126 and P-124 were sampled the same day that samples were obtained from shallow wells at the Jackson Pit and North Hollywood Dumps. Samples from the deep wells were taken from the discharge lines of the pumps while the pumps were in operation. Samples from the deep wells were collected and processed in the same manner as described for the shallow wells.

WATER-QUALITY DATA

Water samples collected during this initial phase of the project were sent to the U.S. Geological Survey Central Laboratory at Atlanta, Ga., for analysis. The analysis was made according to schedules calling for common constitutents in ground water, selected trace elements, and selected organic compounds. The samples from well K-126 were not analyzed for selected organic compounds, and those from well 0-230 were not analyzed for common constituents.

Table 3 gives the analyses for water from the eight shallow wells in the water-table aquifer; table 4 gives the analyses for the two deep wells in the Memphis Sand.

TABLE 3.--Water-quality data from shallow wells in the water-table aquifer at abandoned waste-disposal dumps.

WELL J-152

DATE	SAMPLING DEPTH (FT)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE, WATER (DEG C)	COLOR (PLATINUM COBALT UNITS)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)
JUN 20...	29	1850	6.7	25.0	15	<1	K2	490	0	99	59	150

DATE	POTASSIUM, DISSOLVED (MG/L AS K)	ALKALINITY (MG/L AS CACO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS N)
JUN 20...	17	560	20	230	.4	25	1020	957	.16	.16	20	20

DATE	NITROGEN, TOTAL (MG/L AS NO3)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, TOTAL (MG/L AS PO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DISSOLVED (UG/L AS MN)
JUN 20...	89	.330	1.0	6	1000	4	10	2	15000	0	3500	3400

DATE	MERCURY DISSOLVED (UG/L AS HG)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	CYANIDE DISSOLVED (MG/L AS CN)	PHENOLS (UG/L)	METHYLENE BLUE ACTIVE SUBSTANCE (MG/L)	TANNIN AND LIGNIN (MG/L)	PERTHANE TOTAL (UG/L)	PCB, TOTAL (UG/L)
JUN 20...	<.1	19	1	0	70	32	.01	0	.20	.0	.00	.0

DATE	NAPHTHALENES, POLYCHLOR. TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	CHLORDANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)	DIAZINON, TOTAL (UG/L)	DIELDRIN TOTAL (UG/L)	ENDOSULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)
JUN 20...	.00	.00	.0	.00	.00	.00	.04	.00	.00	.00	.00

DATE	HEPTACHLOR, TOTAL (UG/L)	HEPTACHLOR EPOXIDE TOTAL (UG/L)	LINDANE TOTAL (UG/L)	MALATHION, TOTAL (UG/L)	METHOXYCHLOR, TOTAL (UG/L)	METHYL PARATHION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	METHYL TRITHION, TOTAL (UG/L)	PARATHION, TOTAL (UG/L)	TOXAPHENE, TOTAL (UG/L)	TOTAL TRITHION (UG/L)
JUN 20...	.00	.00	.00	.00	.00	.00	.00	.00	.00	0	.00

TABLE 3.--Water-quality data from shallow wells in the water-table aquifer at abandoned waste-disposal dumps. (Cont'd.)

WELL J-153

DATE	SAMPLING DEPTH (FT)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE, WATER (DEG C)	COLOR (PLATINUM COBALT UNITS)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	POTASSIUM, DISSOLVED (MG/L AS K)	ALKALINITY (MG/L AS CACO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)
JUN 23...	33	1500	6.2	25.0	0	<1	<1	4.5	340	.2	240

DATE	FLUORIDE, DISSOLVED (MG/L AS F)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS NO3)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, TOTAL (MG/L AS PO4)	ARSENIC DISSOLVED (UG/L AS AS)
JUN 23...	.2	802	.01	.01	3.0	3.0	13	.080	.25	3

DATE	COPPER, DISSOLVED (UG/L AS CU)	IRON, TOTAL RECOVERABLE (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	CARBON, ORGANIC TOTAL (MG/L AS C)	CYANIDE DISSOLVED (MG/L AS CN)
JUN 23...	2	37000	0	4000	.1	8	1	0	38	.01

DATE	PHENOLS (UG/L)	METHYLENE BLUE ACTIVE SUBSTANCE (MG/L)	TANNIN AND LIGNIN (MG/L)	PERTHANE TOTAL (UG/L)	PCB, TOTAL (UG/L)	NAPHTHALENES, POLYCHLOR. TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	CHLORDANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)
JUN 23...	2	.50	9.0	.00	.0	.00	.00	.1	.00	.00

DATE	DDT, TOTAL (UG/L)	DIAZINON, TOTAL (UG/L)	DIELDRIN TOTAL (UG/L)	ENDOSULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTACHLOR, TOTAL (UG/L)	HEPTACHLOR EPOXIDE TOTAL (UG/L)	LINDANE TOTAL (UG/L)	MALATHION, TOTAL (UG/L)
JUN 23...	.01	.05	.00	.00	.00	.00	.00	.00	.00	.01

DATE	METHOXYCHLOR, TOTAL (UG/L)	METHYL PARATHION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	METHYL TRITHION, TOTAL (UG/L)	PARATHION, TOTAL (UG/L)	TOXAPHENE, TOTAL (UG/L)	TOTAL TRITHION (UG/L)	2,4-D, TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)
JUN 23...	.00	.00	.00	.00	.00	0	.00	.00	.00	.00

TABLE 3.--Water-quality data from shallow wells in the water-table aquifer at abandoned waste-disposal dumps. (Cont'd.)

WELL K-123

DATE	SAMPLING DEPTH (FT)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE, WATER (DEG C)	COLOR (PLATINUM COBALT UNITS)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)
JUN 09...	37	2050	6.9	19.0	10	<1	K4	610	0	140	64	170

DATE	POTASSIUM, DISSOLVED (MG/L AS K)	ALKALINITY (MG/L AS CACO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS NO3)	PHOSPHORUS, TOTAL (MG/L AS P)
JUN 09...	52	970	28	130	.9	14	1200	.04	23	23	100	.050

DATE	PHOSPHORUS, TOTAL (MG/L AS PO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	IRON, TOTAL RECOVERABLE (UG/L AS FE)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)
JUN 09...	.15	4	700	0	14	9	13000	7800	0	7300	8000	.1

DATE	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	CYANIDE DISSOLVED (MG/L AS CN)	PHENOLS (UG/L)	METHYLENE BLUE ACTIVE SUBSTANCE (MG/L)	TANNIN AND LIGNIN (MG/L)	PERTHANE TOTAL (UG/L)	PCB, TOTAL (UG/L)	NAPHTHALENES, POLYCHLOR. TOTAL (UG/L)
JUN 09...	17	0	0	0	43	.00	1	.30	.0	.00	.2	.00

DATE	ALDRIN, TOTAL (UG/L)	CHLORDANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)	DIAZINON, TOTAL (UG/L)	DIELDRIN TOTAL (UG/L)	ENDOSULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTACHLOR, TOTAL (UG/L)	HEPTACHLOR EPOXIDE TOTAL (UG/L)
JUN 09...	.00	.2	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

DATE	LINDANE TOTAL (UG/L)	MALATHION, TOTAL (UG/L)	METHOXYCHLOR, TOTAL (UG/L)	METHYL PARATHION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	METHYL TRITHION, TOTAL (UG/L)	PARATHION, TOTAL (UG/L)	TOXAPHENE, TOTAL (UG/L)	TOTAL TRITHION (UG/L)	2,4-D, TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)
JUN 09...	.00	.00	.00	.00	.00	.00	.00	0	.00	.00	.00	.00

TABLE 3.--Water-quality data from shallow wells in the water-table aquifer at abandoned waste-disposal dumps. (Cont'd.)

WELL K-124

DATE	SAMP- LING DEPTH (FT)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, WATER (DEG C)	COLOR (PLAT- INUM COBALT UNITS)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)
JUN 13...	43	119	5.9	20.0	0	K60	K64	28	0	6.8	2.7	11

DATE	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	ALKA- LINITY (MG/L AS CACO3)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)
JUN 13...	1.2	39	1.0	8.2	.1	21	88	77	.17	.07	1.7	1.9

DATE	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, TOTAL (MG/L AS PO4)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)
JUN 13...	8.3	.210	.64	3	70	2	27	3	11000	240	0	310

DATE	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, DIS- SOLVED (UG/L AS ZN)	PHENOLS (UG/L)	METHY- LENE BLUE ACTIVE SUB- STANCE (MG/L)	TANNIN AND LIGNIN (MG/L)	PER- THANE TOTAL (UG/L)	PCB, TOTAL (UG/L)	NAPH- THA- LENES, POLY- CHLOR. TOTAL (UG/L)
JUN 13...	260	.1	41	0	0	140	0	.00	.1	.00	.0	.00

DATE	ALDRIN, TOTAL (UG/L)	CHLOR- DANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)	DI- AZINON, TOTAL (UG/L)	DI- ELDRIN TOTAL (UG/L)	ENDO- SULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTA- CHLOR, TOTAL (UG/L)	HEPTA- CHLOR EPOXIDE TOTAL (UG/L)
JUN 13...	.00	.2	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

DATE	LINDANE TOTAL (UG/L)	MALA- THION, TOTAL (UG/L)	METH- OXY- CHLOR, TOTAL (UG/L)	METHYL PARA- THION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	METHYL TRI- THION, TOTAL (UG/L)	PARA- THION, TOTAL (UG/L)	TOX- APHENE, TOTAL (UG/L)	TOTAL TRI- THION (UG/L)	2,4-D, TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)
JUN 13...	.00	.00	.00	.00	.00	.00	.00	0	.00	.00	.00	.00

TABLE 3.--Water-quality data from shallow wells in the water-table aquifer at abandoned waste-disposal dumps. (Cont'd.)

WELL O-230

DATE	SAMPLING DEPTH (FT)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE, WATER (DEG C)	COLOR (PLATINUM COBALT UNITS)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	ALKALINITY (MG/L AS CACO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)
JUN 05...	30	6000	7.0	24.5	140	K10	44	1950	5.5	530	.5

DATE	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS NO3)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, TOTAL (MG/L AS PO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)
JUN 05...	30	2440	.03	.03	290	290	1300	3.300	10	44	2300

DATE	CADMIUM DISSOLVED (UG/L AS CD)	COPPER, DISSOLVED (UG/L AS CU)	IRON, TOTAL RECOVERABLE (UG/L AS FE)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)
JUN 05...	0	2	26000	60	0	370	330	.2	6	0

DATE	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	PHENOLS (UG/L)	METHYLENE BLUE ACTIVE SUBSTANCE (MG/L)	TANNIN AND LIGNIN (MG/L)	PERTHANE TOTAL (UG/L)	PCB, TOTAL (UG/L)	NAPHTHALENES, POLYCHLOR. TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)
JUN 05...	0	20	120	12	.00	.2	.00	.3	.00	.00

DATE	CHLORDANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)	DIAZINON, TOTAL (UG/L)	DIELDRIN TOTAL (UG/L)	ENDOSULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTACHLOR, TOTAL (UG/L)
JUN 05...	.0	.00	.00	.00	.00	.00	.00	.00	.00	.00

DATE	HEPTACHLOR EPOXIDE TOTAL (UG/L)	LINDANE TOTAL (UG/L)	MALATHION, TOTAL (UG/L)	METHOXYCHLOR, TOTAL (UG/L)	METHYL PARATHION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	METHYL TRITHION, TOTAL (UG/L)	PARATHION, TOTAL (UG/L)	TOXAPHENE, TOTAL (UG/L)	TOTAL TRITHION (UG/L)
JUN 05...	.00	.00	.00	.00	.00	.00	.00	.00	0	.00

TABLE 3.--Water-quality data from shallow wells in the water-table aquifer at abandoned waste-disposal dumps. (Cont'd.)

WELL P-121

DATE	SAMPLING DEPTH (FT)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE, WATER (DEG C)	COLOR (PLATINUM COBALT UNITS)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)
JUN 11...	24	2800	6.4	23.0	30	K3	<1	530	0	110	61

DATE	SODIUM, DISSOLVED (MG/L AS NA)	POTASSIUM, DISSOLVED (MG/L AS K)	ALKALINITY (MG/L AS CACO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)
JUN 11...	270	50	660	4.5	400	.2	28	1370	1360	.00	.04

DATE	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS NO3)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, TOTAL (MG/L AS PO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	IRON, TOTAL RECOVERABLE (UG/L AS FE)
JUN 11...	57	57	250	.150	.46	13	2500	0	23	2	30000

DATE	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	CYANIDE DISSOLVED (MG/L AS CN)
JUN 11...	25000	0	11000	11000	.6	63	0	0	70	57	.00

DATE	PHENOLS (UG/L)	METHYLENE BLUE ACTIVE SUBSTANCE (MG/L)	TANNIN AND LIGNIN (MG/L)	PERTHANE TOTAL (UG/L)	PCB, TOTAL (UG/L)	NAPHTHALENES, POLYCHLOR. TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	CHLORDANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)
JUN 11...	9	.40	.1	.00	.4	.00	.00	.2	.00	.00

DATE	DDT, TOTAL (UG/L)	DIAZINON, TOTAL (UG/L)	DIELDRIN TOTAL (UG/L)	ENDOSULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTACHLOR, TOTAL (UG/L)	HEPTACHLOR EPOXIDE TOTAL (UG/L)	LINDANE TOTAL (UG/L)	MALATHION, TOTAL (UG/L)
JUN 11...	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

DATE	METHOXYCHLOR, TOTAL (UG/L)	METHYL PARATHION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	METHYL TRITHION, TOTAL (UG/L)	PARATHION, TOTAL (UG/L)	TOXAPHENE, TOTAL (UG/L)	TOTAL TRITHION (UG/L)	2,4-D, TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)
JUN 11...	.00	.00	.00	.00	.00	0	.00	.00	.00	.00

TABLE 3.--Water-quality data from shallow wells in the water-table aquifer at abandoned waste-disposal dumps. (Cont'd.)

WELL P-122

DATE	SAMPLING DEPTH (FT)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE, WATER (DEG C)	COLOR (PLATINUM COBALT UNITS)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)
JUN 04...	19	1050	6.8	16.5	2	<1	<1	320	0	71	34	80

DATE	POTASSIUM, DISSOLVED (MG/L AS K)	ALKALINITY (MG/L AS CACO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS N)
JUN 04...	5.1	360	90	45	.3	26	626	578	.02	.02	16	16

DATE	NITROGEN, TOTAL (MG/L AS NO3)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, TOTAL (MG/L AS PO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	IRON, TOTAL RECOVERABLE (UG/L AS FE)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)
JUN 04...	71	.480	1.5	4	90	9	17	0	8000	5700	0	5000

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	CYANIDE DISSOLVED (MG/L AS CN)	PHENOLS (UG/L)	METHYLENE BLUE ACTIVE SUBSTANCE (MG/L)	TANNIN AND LIGNIN (MG/L)	PERTHANE TOTAL (UG/L)
JUN 04...	4500	<.1	1	0	0	4	15	2.5	1	.20	.0	.00

DATE	PCB, TOTAL (UG/L)	NAPHTHALENES, POLYCHLOR. TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	CHLORDANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)	DIAZINON, TOTAL (UG/L)	DIELDRIN TOTAL (UG/L)	ENDOSULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)
JUN 04...	.0	.00	.00	.0	.00	.00	.00	.00	.00	.00	.00	.00

DATE	HEPTACHLOR, TOTAL (UG/L)	HEPTACHLOR EPOXIDE TOTAL (UG/L)	LINDANE TOTAL (UG/L)	MALATHION, TOTAL (UG/L)	METHOXYCHLOR, TOTAL (UG/L)	METHYL PARATHION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	METHYL TRITHION, TOTAL (UG/L)	PARATHION, TOTAL (UG/L)	TOXAPHENE, TOTAL (UG/L)	TOTAL TRITHION (UG/L)
JUN 04...	.00	.00	.00	.00	.00	.00	.00	.00	.00	0	.00

TABLE 3.--Water-quality data from shallow wells in the water-table aquifer at abandoned waste-disposal dumps. (Cont'd.)

WELL P-123

DATE	SAMPLING DEPTH (FT)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE, WATER (DEG C)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS NO3)	PHOSPHORUS, TOTAL (MG/L AS P)
JUN 03...	29	570	6.4	20.5	<1	<1	.02	.46	.48	2.1	.300

DATE	PHOSPHORUS, TOTAL (MG/L AS PO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	LEAD, DISSOLVED (UG/L AS PB)	MERCURY DISSOLVED (UG/L AS HG)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)
JUN 03...	.92	130	90	6	14	1	0	<.1	3	0	0

DATE	ZINC, DISSOLVED (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	PHENOLS (UG/L)	METHYLENE BLUE ACTIVE SUBSTANCE (MG/L)	TANNIN AND LIGNIN (MG/L)	PERTHANE TOTAL (UG/L)	PCB, TOTAL (UG/L)	NAPHTHALENES, POLYCHLOR. TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	CHLORDANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)
JUN 03...	20	10	0	.00	.0	.00	.0	.00	.00	.0	.00

DATE	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)	DIAZINON, TOTAL (UG/L)	DIELDRIN TOTAL (UG/L)	ENDOSULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTACHLOR, TOTAL (UG/L)	HEPTACHLOR EPOXIDE TOTAL (UG/L)	LINDANE TOTAL (UG/L)	MALATHION, TOTAL (UG/L)
JUN 03...	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

DATE	METHOXYCHLOR, TOTAL (UG/L)	METHYL PARATHION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	METHYL TRITHION, TOTAL (UG/L)	PARATHION, TOTAL (UG/L)	TOXAPHENE, TOTAL (UG/L)	TOTAL TRITHION (UG/L)	2,4-D, TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)
JUN 03...	.00	.00	.00	.00	.00	0	.00	.00	.00	.00

TABLE 4.--Water-quality data from deep wells in the Memphis Sand downgradient from abandoned waste-disposal dumps.

WELL K-126

DATE	SAMPLING DEPTH (FT)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE, WATER (DEG C)	COLOR (PLATINUM COBALT UNITS)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)
JUN 09...	302	95	5.9	18.0	0	<1	<1	23	0	5.4	2.3	9.6

DATE	POTASSIUM, DISSOLVED (MG/L AS K)	ALKALINITY (MG/L AS CACO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N)
JUN 09...	.6	31	2.6	4.5	.1	17	65	61	.06	.05	.36

DATE	NITROGEN, TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS NO3)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, TOTAL (MG/L AS PO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)
JUN 09...	.42	1.9	.000	.00	2	40	1	10	3	200	0

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	CYANIDE DISSOLVED (MG/L AS CN)	PHENOLS (UG/L)	METHYLENE BLUE ACTIVE SUBSTANCE (MG/L)	TANNIN AND LIGNIN (MG/L)
JUN 09...	7	<.1	0	0	0	0	2.0	.00	0	.00	.0

TABLE 4.--Water-quality data from deep wells in the Memphis Sand downgradient from abandoned waste-disposal dumps. (Cont'd.)

WELL P-124

DATE	SAMPLING DEPTH (FT)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE, WATER (DEG C)	COLOR (PLATINUM COBALT UNITS)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)
JUN 11...	466	180	6.2	18.0	0	<1	K1	74	0	17	7.7	9.7

DATE	POTASSIUM, DISSOLVED (MG/L AS K)	ALKALINITY (MG/L AS CACO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS N)
JUN 11...	1.0	84	5.4	3.0	.1	11	95	106	.00	.01	.00	.00

DATE	NITROGEN, TOTAL (MG/L AS NO3)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, TOTAL (MG/L AS PO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)
JUN 11...	.00	.000	.00	4	90	0	11	4	520	0	20	.3

DATE	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	CYANIDE DISSOLVED (MG/L AS CN)	PHENOLS (UG/L)	METHYLENE BLUE ACTIVE SUBSTANCE (MG/L)	TANNIN AND LIGNIN (MG/L)	PERTHANE TOTAL (UG/L)	PCB, TOTAL (UG/L)	NAPHTHALENES, POLYCHLOR. TOTAL (UG/L)
JUN 11...	2	0	0	7	.2	.00	0	.00	.0	.00	.0	.00

DATE	ALDRIN, TOTAL (UG/L)	CHLORDANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)	DIAZINON, TOTAL (UG/L)	DIELDRIN TOTAL (UG/L)	ENDOSULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTACHLOR, TOTAL (UG/L)	HEPTACHLOR EPOXIDE TOTAL (UG/L)
JUN 11...	.00	.0	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

DATE	LINDANE TOTAL (UG/L)	MALATHION, TOTAL (UG/L)	METHOXYCHLOR, TOTAL (UG/L)	METHYL PARATHION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	METHYL TRITHION, TOTAL (UG/L)	PARATHION, TOTAL (UG/L)	TOXAPHENE, TOTAL (UG/L)	TOTAL TRITHION (UG/L)	2,4-D, TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)
JUN 11...	.00	.00	.00	.00	.00	.00	.00	0	.00	.00	.00	.00

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